Claims

What is claimed is:

~~1.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals comprising

A plurality of antennas;

A plurality of Radio Frequencies receivers, equal the number of antennas;

A plutality of phase digitizers, equal the number of antennas;

Devices to digitally calculate the the phase difference between ~~an~~any two antennas;

Devices to digitally calculate the instantaneous frequency of a detected signal;

Devices to digitally calculate, from frequency and phase differences data, the azimuth ~~of~~to a source of radio signal.

~~2.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 1, wherein the plurality of antennas is a minimum of ~~three~~two antennas.

~~3.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 1, wherein each antenna connects to a receiver.

~~4.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 1, wherein each receiver generates in response to a signal received from an antenna, two sinusoidal output signals at a frequency within the operating bandwidth of half the instruction clock frequency, and wherein the phase difference between the two generated signals is about 90°.

~~5.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 1, wherein each phase digitizer connects to one receiver, and generates in response to signals received from the receiver a digital output indicative of the instantaneous phase of the signals received from the receiver, at the instance of the transition of an instruction clock pulse.

~~6.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 1, wherein the devices used to calculate the phase differences between antennas comprise of digital subteractors and adders.

~~7.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 1, wherein the instantaneous frequency ~~can be~~is calculated by digitally obtaining of the phase difference in a signal received, over a span of a single clock period.

~~8.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 1, wherein the results of frequency and phase

differences calculations may be improved by averaging of digital data generated over a plurality of the sampling clock periods.

~~9.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals comprising

A plurality of antennas on a horizontal plane;

An additional antenna;

A plurality of Radio Frequencies receivers, equal the number of antennas;

A plutality of phase digitizers, equal the number of antennas;

Devices to digitally calculate the the phase difference between ant two antennas;

Devices to digitally calculate the instantaneous frequency of a detected signal;

Devices to digitally calculate, from frequency and phase differences data, the azimuth of a source of radio signal.

~~10.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein the plurality of antennas on a horizontal plane is a minimum of ~~three~~two antennas

~~11.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein an additional antenna is erected on a vertical axis perpendicular to the horizontal plane and common in axis with one antenna on the horizontal plane.

~~12.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein each antenna connects to a receiver.

~~13.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein each receiver generates in response to a signal received from an antenna, two sinusoidal output signals at a frequency within the operating bandwidth of half the sampling clock frequency, and wherein the phase difference between the two signals is about 90°.

~~14.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein each phase digitizer connects to one receiver, and generates in response to signals received from the receiver a digital output indicative of the instantaneous phase of the signals received from the receiver, at the instance of the transition of an instruction clock pulse.

~~15.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein the devices used to calculate the phase differences between antennas comprise of digital subteractors and adders.

~~16.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein the instantaneous frequency

~~can be~~is calculated by digitally obtaining of the phase difference in a signal received, over a span of a single sampling clock period.

~~17.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 9, wherein the results of frequency and phase differences calculations may be improved by averaging of digital data generated over a plurality of sampling clock periods.

~~18.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals comprising

~~A four~~Four antennas;

~~A four~~Four Radio Frequencies receivers;

~~A four~~Four phase digitizers;

Devices to digitally calculate the the phase difference between ant two antennas;

Devices to digitally calculate the instantaneous frequency of a detected signal;

Devices to digitally calculate, from frequency and phase differences data, the azimuth of a source of radio signal.

~~19.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein four antennas are mounted on a horizontal plane.

~~20.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein four antennas are mounted on a horizontal plane as two pairs of antennas wherein each pair of antennas is mounted on one common axis, and further wherein the axes of the two pairs of antennas are perpendicular to each other.

~~21.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein each antenna connects to a receiver.

~~22.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein each receiver generates in response to a signal received from an antenna, two sinusoidal output signals at a frequency within the operating bandwidth of half the sampling clock frequency, and wherein the phase difference between the two signals is about 90°.

~~23.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein each phase digitizer connects to one receiver, and generates in response to signals received from the receiver a digital output indicative of the instantaneous phase of the signals received from the receiver, at the instance of the transition of an instruction clock pulse.

~~24.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein the devices used to calculate the phase differences between antennas comprise of digital subteractors and adders.

~~25.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein the instantaneous frequency ~~can be~~is calculated by digitally obtaining of the phase difference in a signal received, over a span of a single sampling clock period.

~~26.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 18, wherein the results of frequency and phase differences calculations may be improved by averaging of digital data generated over a plurality of clock periods.

~~27.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals comprising

Four antennas on a horizontal plane;

An additional antenna;

~~A four~~Five Radio Frequencies receivers;

~~A four~~Five phase digitizers;

Devices to digitally calculate the the phase difference between ant two antennas;

Devices to digitally calculate the instantaneous frequency of a detected signal;

Devices to digitally calculate, from frequency and phase differences data, the azimuth of a source of radio signal.

~~28.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein four antennas are mounted on a horizontal plane as two pairs of antennas wherein each pair of antennas is mounted on one common axis, and further wherein the axes of the two pairs of antennas are perpendicular to each other.

~~29.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein an additional antenna is erected on a vertical axis perpendicular tp the horizontal plane and common with one antenna on the horizontal plane.

~~30.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein each antenna connects to a receiver.

~~31.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein each receiver generates in response to a signal received from an antenna, two sinusoidal output signals at a frequency within the operating bandwidth of half the sampling clock frequency, and wherein the phase difference between the two signals is about 90°.

~~32.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein each phase digitizer connects to one receiver, and generates in response to signals received from the receiver a digital output

indicative of the instantaneous phase of the signals received from the receiver, at the instance of the transition of an instruction clock pulse.

~~33.~~57 (original) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein the devices used to calculate the phase differences between antennas comprise of digital subteractors and adders.

~~34.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein the instantaneous frequency ~~can be~~is calculated by digitally obtaining of the phase difference in a signal received, over a span of a single sampling clock period.

~~35.~~57 (Currently amended) A system for finding the instantaneous spatial azimuth and elevation of a source of radio signals as in claim 27, wherein the results of frequency and phase differences calculations may be improved by averaging of digital data generated over a plurality of sampling clock periods.

~~36.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals comprising

Two directional antennas;

Two radio signals receivers, equal the number of antennas;

Two phase digitizers, equal the number of antennas;

Devices to digitally calculate the the phase difference between the two antennas;

Devices to digitally calculate the instantaneous frequency of a detected signal;

Devices to digitally calculate, from frequency and phase differences data, the azimuth of a source of radio signal.

~~37.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 36, wherein each antenna connects to a receiver.

~~38.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 36, wherein each receiver generates in response to a signal received from an antenna, two sinusoidal output signals at a frequency within the operating bandwidth of half the sampling clock frequency, and wherein the phase difference between the two signals is about 90°.

~~39.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 36, wherein each phase digitizer connects to one receiver, and generates in response to signals received from the receiver a digital output indicative of the instantaneous phase of the signals received from the receiver, at the instance of the transition of an instruction clock pulse.

~~40.~~57 (original) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 36, wherein the devices used to calculate the phase differences between antennas comprise of digital subtractors and adders.

~~41.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 36, wherein the instantaneous frequency can be calculated by digitally obtaining of the phase difference in a signal received, over a span of a single sampling clock period.

~~42.~~57 (Currently amended) A system for finding the instantaneous spatial direction of a source of radio signals as in claim 36, wherein the results of frequency and phase differences calculations may be improved by averaging of digital data generated over a plurality of the sampling clock periods.

43~~.~~ (Withdrawn) ~~A monopulse type radar system comprised of one, two, or three directional antennas, wherein the instantaneous phase of received radio signals is mesured using phase digitizers.~~

44~~.~~(Withdrawn) ~~A "cross-eye" radar deception system comprised of~~

~~Two directional antennas;~~

~~Two radio signals receivers;~~

~~Two phase digitizer;~~

~~Two temporary memories;~~

~~Two digital phase shifters;~~

~~A common digital signal processing and control unit.~~

45~~.~~(Withdrawn) ~~A "cross-eye" radar deception system as in claim 44, wherein the instantaneous phase of a signal received on the antanna is measure utilizing a phase digitizer.~~

46~~.~~(Withdrawn) ~~A "cross-eye" radar deception system as in claim 44, wherein the temporary memory stores consecutive samples of the instantaneous phase of the signal received on the antenna.~~

47~~.~~(Withdrawn) ~~A "cross-eye" radar deception system as in claim 44, wherein instantaneous phase data stored in the memory, can be read back from the temporary memory in the same order in which that data was stored in the memory, and wherein such readback may comrise of a one time readback, or repeated head to tail readbacks.~~

48~~.~~(Withdrawn) ~~A "cross-eye" radar deception system as in claim 44, wherein the the common digital signal processing and control unit receives the digital presentation of the insatntaneous phase of radio signals received on both antennas and digitized by the corresponding phase digitizers, and wherein the digital signal processing unit measures the instantaneous phase difference between signals received on both antennas, and controls the digital phase shifters.~~

49~~.~~(Withdrawn) ~~A "cross-eye" radar deception system as in claim 44, wherein the digital phase shifters receive digital phase shift commands from the digital signal processing~~

~~unit and in response modifies the data readback from the memory to cause a shift in the phase of the signal at the output of a phase to analog converter.~~

~~50.~~(Withdrawn) ~~A "cross-eye" radar deception system as in claim 44, wherein the phase to analog converters receives instantaneous phase data from the digital phase shifter and convert that data into a succession of analog pulses of an amplitude directly proportional to the arcsine of the instantaneous phase as presented by the instantaneous phase data at the input to the converter.~~

51. (New) An instantaneous phase digitizer comprising:

Two input buffers one for each of the two quadrature related sinusoidal input signals;

Two resistive networks each comprised of n-1 resistors having n taps;

An array of n comparators each having two differential inputs wherein one input connects to one tap on one resistive network and wherein the other input connects to one tap on the other resistive network;

An array of n flip-flops each having a data input connecting to one output of a comparator and wherein a sampling clock connects to clock inputs all n flip-flops;

An array of Exclusive OR gates connecting to the outputs of the flip-flops to generate a digital code

52 (New) An instantaneous phase digitizer as in claim 51 wherein the resistive networks in combination with the differential comparators are used to perform n vectorial summations on fractions of the two quadrature sinusoidal inputs to yield n squrewave signals each shifted in phase by *360°/n* with respect to other n-1 squarewaves.

53 (New) An instantaneous phase digitizer as in claim 51 wherein n flip-flops each receiving one of n squarewaves on its D input and samples that signal on the instance of the transition of the sampling clock.

54 (New) An instantaneous phase digitizer as in claim 51 wherein exclusive-or function gates are used to convert the outputs of n flip-flops to $G = \log_2 n$ Grey code bits and to same number of Binary code bits.

55 (New) A phase measurement system to be used in a Monopulse type radar system comprising an instantaneous phase digitizer as in claim 51.

56 (New) A phase measurement system to be used in a CROSS-EYE type radar deception system comprising an instantaneous phase digitizer as in claim 51.